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UPPER CRETACEOUS SPOROMORPHS FROM THE SOUTHERN PART OF HUNGARY (CSÁVOLY)

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Abstract

The Senonian sediments of the bore-hole of Csávoly-I (South Hungary) were investigated palynologically. The spore-pollen composition is different from those described from the Bakony Region (Transdanubia). The presence of *Endoinfundibulapollis* TSCHUDY 1975 is also a pecularity of this assemblage, this form-genus has been reported previously. In our spore-pollen assemblage there are relatively high numbers of younger types, but at present it is best to give the geologic age, Upper Senonian, "Csávoly-type spore-pollen assemblage."

Key-words: Palynology, Upper Cretaceous, Hungary.

Introduction

Hungary is relatively rich in Senonian sedimentary deposits, but our palynologic knowledge is poor in relation to that of the other countries of Europe. Moreover, selected data have been published from only one region (Transdanubia) and there is no information presently available from other areas in Hungary.

The aim of the present investigation is a taxonomic elaboration of the complete spore-pollen assemblage of the south part of the Hungarian Plain, both from a paleoecological and stratigraphical point of view. This paper presents the first report on the Senonian palynology of South Hungary.

Materials and Methods

The investigation material was placed at my disposal by DR. M. MUCSI and DR. T. SZEDERKÉNYI (Department of Mineralogy, Geochemistry and Petrography, A. J. University, Szeged). The following samples were studied from the borehole Csávoly-I:

Csáv-I-1. — 18/1, 1271.5 — 1271.7 m., limestone
Csáv-I-2. — 19, 1310.5 — 1312.5 m., limestone
Csáv-I-3. — 23, 1487.0 — 1490.0 m., marl with aleurite
Csáv-I-4. — 24, 1540.0 — 1541.0 m., sandy marl
Csáv-I-5. — 25, 1550.0 — 1551.0 m., marl, with quartz and pyrit
Csáv-I-6. — 26, 1586.5 — 1587.5 m., marl, with sand and pyrit.

The samples were prepared by using HCl, washing — separation with $ZnCl_2$ — washing — HF — washing, and the slides were prepared using glycerin-jelly. Only the LM method was used during the course of this investigation but it seems that future electronmicroscopic studies would be of value projected.

Results

1. New taxa

Form-genus: *Romeinipollenites* Kds. and Herngr. 1980
Romeinipollenites hungaricus n. fsp.
(Plate III, figs. 9, 10, fig. 1)

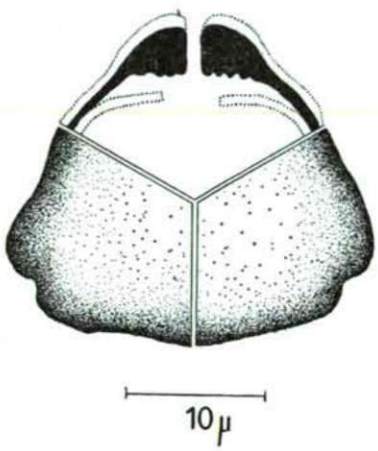

Fig. 1. *Romeinipollenites hungaricus* n. fsp.

Diagnosis

Equatorial contour triangular, with slightly convex sides. Surface smooth or very finely scabrate. Extragerminal exine is about 1–1.5 µm, the infratectal layer is the thinnest between the ectexine layers. The structure is not clearly definible using light microscope methods. Exoapertures consist of very short asymmetrical colpi. The annulus is 3–4 µm thick and the vestibulum is narrow and short. The diameter of the endopores is 4–5 µm.

Diameter: 24–30 µm.
Holotype: Plate III, figs. 9, 10, slide Csáv-I-1-6, 19.3/105.8.
Locus typicus: Csávoly.
Stratum typicum: limestone, upper Senonian.
Derivatio nominis: from Hungary.
Differential diagnosis: The smooth surface, the thinner annulus and the smaller size clearly separate this species from *R. granulatus* Kds. and Herngr. 1980.

Form-genus: *Interporopollenites* Weyl. and Krieg. 1953
Interporopollenites csavolyensis n. fsp.
(Plate IV, figs. 1, 2, fig. 2)

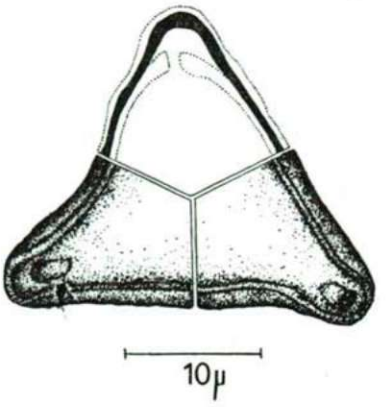

Fig. 2. *Interporopollenites csavolyensis* n. fsp.

Diagnosis

Amb triangular, with straight or slightly concave sides. Surface finely punctate-granulate. Extragerminal exine 1.5–1.8 μm thick, the tectum, infratectal layer and the foot layer are of equal thickness. The structure of the infratectal layer is not clearly visible by light microscopic methods, but it is probably granular. The apertural areas are connected by arcus-like thickenings. Exoapertures are radially elongated pores, 2×3 μm. Vestibulum 3 μm vide, endannulus 1.8 μm thick.

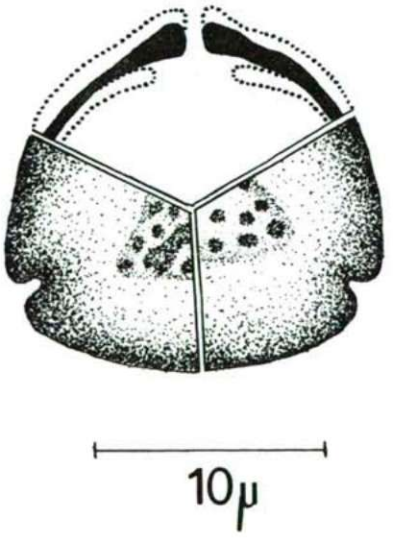

Fig. 3. *Papillopollis csavolyensis* n. fsp.

Diameter: 20–28 μm.
Holotype: Plate IV, figs. 1, 2, slide Csáv-I-2-3, 19.4/117.8.
Locus typicus: Csávoly.
Stratum typicum: limestone, upper Senonian.
Derivatio nominis: from Csávoly, the type locality.
Differential diagnosis: The smaller size and the punctate-granulate surface serve to distinguish *I. csavolyensis* from *I. plicatus* KDS. and HEG. 1975.

Form-genus: *Papillopollis* PF. 1953
Papillopollis csavolyensis n. fsp.
(Plate IV, figs. 23, 24, fig. 3)

Diagnosis

Amb triangular, with concave sides. Surface smooth or finely punctate. Interapertural exine is 2 μm thick, the foot layer is the thinnest between the ectexine layers. Structure of the infratectal layer is not clearly visible by light microscopy. Exoapertures are short asymmetrical colpi. Annulus is 2 μm thick, the infratectal layer is thickened in the apertural region. Endoapertures striate. On both polar areas there are papilli in the form of triangles. The papillus is atypical and consists of several tectum remnants which are usually circular but are sometimes irregular in outline.

Diameter: 14–20 μm.
Holotype: Plate IV, figs. 23, 24, slide Csáv-I-1-2, 17.3/110.3.
Locus typicus: Csávoly.
Stratum typicum: limestone, upper Senonian.
Derivatio nominis: from Csávoly, the type locality.
Differential diagnosis: The fine morphology of the polpapillus serves to distingish *P. csavolyensis* from *P. guinetii* KDS. and PITT. 1979 and the presence of an atrium separates it from *P. cretacicus* KDS. and PITT. 1979.

Papillopollis csavolyensis n. fsp. forma magna n. f.
(Plate IV, figs. 25, 26)
The specimens of this fsp. range in size from 21 to 28 μm in diameter.

2. THE SPORE-POLLEN ASSEMBLAGE OF THE SENONIAN OF CSÁVOLY

2.1. Ecologically important sporomorphs: *Salviniaceae, Salvinia* v. *Azolla* (*Hydrosporis* ex gr. *levis* W. KR. 1962, pl. I, figs. 1. 2), *Gleicheniaceae* (*Dictyophyllidites* ex gr. *teuplitzensis* (W. KR. 1962) n. comb. *teuplitzensis*, pl. I, figs. 3, 4, syn: 1962, KRUTZSCH. — *Toroisporis* (*Toroisporis*) *teuplitzensis* n. fsp. subfsp. *teuplitzensis*, p. 78, pl. 32, figs. 1–10, *Dictyophyllidites* fsp. pl. I, figs. 5, 6), *Schizaeaceae, Schizaea* (*Cicatricososporites* fsp., pl. II, figs. 7, 8, *Reticulosporis* fsp., pl. II, figs. 9. 10), *Selaginellaceae* (*Echinatisporis* fsp., pl. I, figs. 15, 16), *Pteridaceae* (*Polypodiaceoisporites* fsp. 1, 2, pl. II, figs. 1, 2, 3, 4), *Polypodiaceae* (*Polypodiidites saalensis* (W. KR. 1959) W. KR. 1963, pl. II, figs. 5, 6), *Araucariaceae* (*Araucariacites balinkaense* KDS. 1974, pl. III. figs. 3,4).

2.2. The *Vadaszisporites* group is characteristic of the entire Cretaceous (Pl. I, figs. 7, 8, 9, 10), *Cristatitriletes* fsp. (pl. I, figs. 11, 12) and *Callisporites* fsp. (pl. I, figs. 13, 14) are relatively "old" spore types.

2.3. The very low number of gymnosperm pollen grains, and the lack of the *Classopollis* group also seems ecologically important. The few *Abietaceae* pollen grains (*Pityosporites* fsp., 1, 2, pl. II, figs. 11, 12, pl. III, figs. 1, 2) probably came from the highland vegetation.

2.4. From a paleophytogeographical point of view the *Endoinfundibulapollis* form-genus (*E. distinctus* R. TSCHUDY 1975, pl. IV, figs. 5, 6, E. fsp., pl. IV. figs. 7, 8) has a special importance.

2.5. Early *Angiosperm* pollen types, which first appear in the Lower Cretaceous: *Retitricolpites subtilimaculatus* LAING 1975, pl. VI, figs. 11, 12, *Retitricolpites exiguiexemplum* LAING 1975, pl. VI, figs. 13, 14.

2.6. Pollen types which have a general Senonian distribution: *Gemmamonocolpites* fsp., pl. III, figs. 5, 6, cf. *Longanulipollis* fsp., pl. III, figs. 7, 8, *Complexiopollis lusitanicus* KDS. and DIN. in print/a, pl. III, figs. 13, 14, *Interporopollenites zaklinskaiae* KDS. and HEG. 1975, pl. III, figs. 15, 16, *Interporopollenites csavolyensis* n. fsp., pl. IV, figs. 1, 2, *Interporopollenites stanleyi* KDS. and HEG. 1975, pl. IV. figs. 3, 4, *Suemegipollis triangularis* GÓCZ. 1964, pl. IV, figs. 13, 14, *Vacuopollis prezensis* KDS. and DIN. in print/a, pl. IV. figs. 15, 16, *Plicapollis silicatus* PF. 1953, pl. IV. figs. 17, 18, *Plicapollis serta* PF. 1953, pl. IV, figs. 19, 20, *Verruoculopollis* fsp., KDS. and DIN. in print/b, pl. IV, figs. 21, 22, *Papillopollis csavolyensis* n. fsp., pl. IV, figs. 23–26, *Trudopollis proparvus* PF. 1953, pl. V, figs. 3, 4, *Trudopollis hemiparvus* PF. 1953, pl. V, figs. 5, 6, *Trudopollis* fsp., pl. V, figs. 7, 8, cf. *Trudopollis* fsp., pl. V, figs. 9, 10, *Normapolles* fgen. et fsp. indet., pl. V, figs. 13, 14.

2.7. Maestrichtian — Danian Normapolles types: *Romeinipollenites hungaricus* n. fsp., pl. III, figs. 9, 10, *Magnoporopollis krutzschii* KDS. and HERNGR. 1980, pl. III, figs. 11, 12, *Pseudosculapollis tschudyi* KDS. and HERNGR. 1980, pl. IV, figs. 9, 10, *Elsikipollenites maastrichtiensis* KDS. and HERNGR. 1980, pl. IV, figs. 27, 28, *Trudopollis hojrupensis* KDS. 1979, pl. IV, figs. 29, 30, *Trudopollis triangulus* KDS. and HERNGR., pl. IV, figs. 31, 32, *Trudopollis lativerrucatus* KDS. and HERNGR. 1980, pl. V, figs. 1, 2, *Hofkeripollenites capsula* (PF. 1953) KDS. and HERNGR. 1980, pl. V, figs. 11, 12.

2.8. Cretaceous — Tertiary pollen grains, which are for the most part characteristic of the Lower Tertiary: *Rugutriporites balinkaense* (KDS. 1974) KDS. 1982 subfsp. *minor* KDS. 1974, cf. *Ulmaceae,* pl. V, fig. 15, 16, *Triporopollenites minimus* KDS. 1974, *Juglandaceae,* pl. V, figs. 17, 18, *Triporopollenites costatus* TAKAHASHI 1961, *Corylaceae,* pl. V, figs. 19, 20, *Subtriporopollenites constans* PF. 1953 subfsp. *medius* W. KR. and VANH. 1977, cf. *Juglandaceae,* pl. V, figs. 21, 22, *Subtriporopollenites constans* PF. 1953 cf. subfsp. *minor* KDS. 1970, pl. V, figs. 23, 24, *Subtriporopollenites facilis* (BOTSCH. 1960) KDS. 1970, *Juglandaceae,* pl. VI, figs. 1, 2, *Subtriporopollenites urkutensis* KDS. 1974, *Juglandaceae,* cf. CARYA, pl. VI, figs. 3, 4, cf. *Subtriporopollenites* fsp., pl. VI, figs. 5, 6, *Ulmoideipites krempii* ANDERS. 1960, *Ulmaceae,* pl. VI, figs. 7, 8, *Retitricolporites tenuiformis* (GROOT, PENNY, and GROOT 1961) KDS. in print, pl. VI, figs. 9, 10, *Cupuliferoipollenites oviformis* (R. POT. 1931) R. POT. 1960, *Fagaceae, Castanea,* pl. VI, figs. 15, 16, *Cyrillaceaepollenites exactus* (R. POT. 1931) R. POT. 1960, *Cyrillaceae, Clethraceae* v. *Theaceae,* pl. VI, figs. 17, 18, *Intragranulitricolporites microporus* KDS. 1978, pl. VI, figs. 19, 20, *Intragranulitricolporites wolffi* KDS. 1978, pl. VI, figs. 21, 22, *Intragranulitricolporites grambasti* KDS. 1978, pl. VI, figs. 23, 24, *Nagyipollis* fsp., pl. VI, fig. 25, 26.

Discussion and conclusions

1. From a paleophytogeographical point of view the first European occurrence of *Endoinfundibulapollis* TSCHUDY 1975 is noteworthy. This, and other facts (the lack of *Hungaropollis, Pseudopapillopollis*) clearly separate this assemblage from those of Transdanubia, previously described from the Bakony region. To better understand the palynostratigraphy of the Senonian layers of the Carpath Basin it is necessary to obtain palynological data from the Balkan Peninsule.

2. There are some problems regarding the palynological age of the Csávoly sedimentary deposits. It is pity that the palynological literature often includes reports only or exclusively of the stemma *Normapolles* as being present in assemblages from the Senonian. Therefore it is not so easy to establish the regional and stratigraphical value of the *Postnormapolles* and other taxa. The basic assemblage (Fish Clay, Lower Danian, KEDVES, 1979, Maestrichtian, stratotype, Gulpen Formation, KEDVES and HERNGREEN, 1980) are in the boreal region of the *Normapolles* province. Probably it will be necessary to create or modify the standards for the Mesogean region. In the Csávoly material there are pollen grains, in remarkable quantity, of so-called "younger type". *Pseudotrudopollis crassiexinus* is a pollen which seems to be characteristic of the Lower Maestrichtian. However, it is not present in the Csávoly section. Probably this is caused only by a regional difference. At present one could refer to it only as the "Upper Senonian, Csávoly-type".

3. The paleophytogeographical differences within the boreal and mesogean (Mediterranean) regions must be studied in detail. A review discussing this point of view was made by KEDVES and DINIZ (in print/b). Based on the conclusion presented in this paper, a knowledge of the complete spore-pollen assemblages is urgently needed from other localities, such as Italy and the Balkan Peninsule etc.

Acknowledgements

The writer is deeply indebted to DR. W. S. DRUGG (Chevron Oil Field Research Company, La Habra, California, U. S. A.) for critically reading the manuscript for linguistic errors.

Plate I

1, 2. *Hydrosporis* ex gr. *levis* W. KR. 1962, *Salvinia* v. AZOLLA, slide Csáv-I-2-6, 6.8/106.9.
3, 4. *Dictyophyllidites* ex gr. *teuplitzensis* (W. KR. 1962) n. comb. *teuplitzensis, Gleicheniaceae*, slide Csáv-I-1-3, 19.1/102.8.
5, 6. *Dictyophyllidites* fsp., *Gleicheniaceae*, slide Csáv-I-1-9, 14.7/116.4.
7, 8. *Vadaszisporites sacali* DEÁK and COMBAZ 1967, *Lycopodiaceae*, slide Csáv-I-2-3, 20.0/104.6.
9, 10. Cf. *Vadaszisporites* fsp., slide Csáv-I-1-2: 6.9/118.0.
11, 12. *Cristatitriletes* fsp., slide Csáv-I-2-2, 10.8/107.8.
13, 14. *Callisporites* fsp., slide Csáv-I-3-5, 3.9/113.8.
15, 16. *Echinatisporis* fsp., *Selaginellaceae*, slide Csáv-I-1-5, 7.2/118.9.
N: x1000

Plate II

1, 2. *Polypodiaceoisporites* fsp.$_1$, *Pteridaceae*, slide Csáv-I-1-10, 19.7/101.4.
3, 4. *Polypodiaceoisporites* fsp.$_2$, *Pteridaceae*, slide Csáv-I-6-3, 19.7/119.0.
5, 6. *Polypodiidites senalensis* (W. KR. 1959) W. KR. 1963, *Polypodiaceae*, slide Csáv-I-1-4, 14.9/104.3.
7, 8. *Cicatricosoporites* fsp., *Schizaeaceae, Schizaea*, slide Csáv-I-3-7, 13.5/106.9.
9, 10. *Reticulosporis* fsp., *Schizaeaceae, Schizaea*, slide Csáv-I-2-7, 16.7/110.3.
11, 12. *Pityosporites* fsp.$_1$, *Abietaceae*, slide Csáv-I-1-2, 7.8/105.1.
N: x1000

Plate III

1, 2. *Pityosporites* fsp.$_2$, *Abietaceae*, slide Csáv-I-1-1, 10.3/117.8.
3, 4. *Araucariacites balinkaense* KDs. 1974, *Araucariaceae*, slide Csáv-I-1-2, 15.9/116.6.
5, 6. *Gemmamonocolpites* fsp., slide Csáv-I-3-5, 16.6/103.6.
7, 8. Cf. *Longanulipollis* fsp., slide Csáv-I-1-1, 16.3/110.9.
9, 10. *Romeinipollenites hungaricus* n. fsp., slide Csáv-I-1-6, 19.3/105.8.
11, 12. *Magnoporopollis krutzschii* KDs. and HERNGR. 1980, slide Csáv-I-2-1, 5.3/104.9.
13, 14. *Complexiopollis lusitanicus* KDs. and DIN. in print/a, slide Csáv-I-1-3, 10.7/105.4.
15 16. *Interporopollenites zaklinskaiae* KDs. and HEG. 1975, slide Csáv-I-1-2, 12.8/110.3.
N: x1000

Plate IV

1, 2. *Interporopollenites csavolyensis* n. fsp., slide Csáv-I-2-3, 19.4/117.8.
3, 4. *Interporopollenites stanleyi* KDs. and HEG. 1975, slide Csáv-I-1-8, 19.9/114.1.
5, 6. *Endoinfundibulapollis distinctus* R. TSCHUDY 1975, slide Csáv-I-2-6, 17.6/111.7.
7, 8. *Endoinfundibulapollis* fsp., slide Csáv-I-1-3, 12.9/107.3.
9, 10. *Pseudosculapollis tschudyi* KDs. and HERNGR. 1980, slide Csáv-I-1-1, 15.2/114.8.
11, 12. *Pseudosculapollis* fsp., slide Csáv-I-1-4, 15.8/108.3.
13, 14. *Suemegipollis triangularis* GÓCZ. 1964, slide Csáv-I-2-9, 14.6/104.7.
15, 16. *Vacuopollis prezensis* KDs. and DIN. in print/a, slide Csáv-I-1-8, 19.6/117.8.
17, 18. *Plicapollis silicatus* PF. 1953, slide Csáv-I-1-5, 7.4/117.5.
19, 20. *Plicapollis serta* PF. 1953, slide Csáv-I-1-9, 20.8/109.5.
21, 22. *Verruoculopollis* fsp., KDs. and DIN. in print/b, slide Csáv-I-1-10, 12.7/109.5.
23, 24. *Papillopollis csavolyensis* n. fsp., subfsp. *csavolyensis*, slide Csáv-I-1-2, 17.3/110.3.
25, 26. *Papillopollis csavolyensis* n. fsp. forma *magna* n. f., slide Csáv-I-1-5, 17.4/109.3.
27, 28. *Elsikipollenites maastrichtiensis* KDs. and HERNGR. 1980, slide Csáv-I-1-2, 21.1/113.7.
29, 30. *Trudopollis hojrupensis* KDs. 1979, slide Csáv-I-1-8, 17.3/116.8.
31, 32. *Trudopollis triangulus* KDs. and HERNGR. 1980, slide Csáv-I-1-2, 15.5/111.9.
N: x1000

Plate V

1, 2. *Trudopollis lativerrucatus* KDs. and HERNGR. 1980, slide Csáv-I-1-9, 16.1/115.3.
3, 4. *Trudopollis proparvus* PF. 1953, slide Csáv-I-1-6, 8.6/116.8.
5, 6. *Trudopollis hemiparvus* PF. 1953, slide Csáv-I-1-1, 8.3/114.7.
7, 8. *Trudopollis* fsp., slide Csáv-I-1-3, 14.7/116.9.
9, 10. Cf. *Trudopollis* fsp., slide Csáv-I-1-6, 12.9/116.2.
11, 12. *Hofkeripollis capsula* (PF. 1953) KDs. and HERNGR. 1980, slide Csáv-I-1-2, 18.3/105.4.
13, 14. *Normapolles* fgen. et fsp. indet., slide Csáv-I-1-1, 8.2/106.3.
15, 16. *Rugutriporites balinkaense* (KDs. 1974) KDs. 1982 subfsp. *minor* KDs. 1974, cf. *Ulmaceae*, slide Csáv-I-1-10, 6.7/110.8.
17, 18. *Triporopollenites minimus* KDs. 1974, cf. *Juglandaceae*, slide Csáv-I-1-4, 4.6/103.3.
19, 20. *Triporopollenites costatus* TAKAHASHI 1961, *Corylaceae*, slide Csáv-I-1-5, 16.8/105.3.
21, 22. *Subtriporopollenites constans* PF. 1953 subfsp. *medius* W. KR. and WANH. 1977, cf. *Juglandaceae*, slide Csáv-I-1-8, 8.5/105.8.
23, 24. *Subtriporopollenites constans* PF. 1953 cf. subfsp. *minor* KDs. 1970, slide Csáv-I-1-9, 13.6/115.9
N: x1000

Plate VI

1, 2. *Subtriporopollenites facilis* (BOTSCH. 1960) KDs. 1970, *Juglandaceae*, slide Csáv-I-1-7, 9.5/112,4.
3, 4. *Subtriporopollenites urkutensis* KDs. 1974, *Juglandaceae*, cf. *Carya*, slide Csáv-I-1-1, 16.1/117.0.
5, 6. Cf. *Subtriporopollenites* fsp., slide Csáv-I-1-1, 12.2/114.4.
7, 8. *Ulmoideipites krempii* ANDERS. 1960, *Ulmaceae*, slide Csáv-I-1-1, 20.3/115.2.
9, 10. *Retitricolpites tenuiformis* (GROOT, PENNY and GROOT, 1961) KDs. in print, slide Csáv-I-1-2, 9.7/108.5.
11, 12. *Retitricolpites subtilimaculatus* LAING 1975, slide Csáv-I-1-2, 11.4/110.6.

13, 14. *Retitricolpites exiguiexemplum* LAING 1975, slide Csáv-I-1-1, 21.2/110.9.
15, 16. *Cupuliferoipollenites oviformis* (R. POT. 1931) R. POT. 1960, *Fagaceae, Castanea*, slide Csáv-I-1-1, 15.0/109.8.
17, 18. *Cyrillaceaepollenites exactus* (R. POT. 1931) R. POT. 1960, *Cyrillaceae, Clethraceae* v. *Theaceae*, slide Csáv-I-1-1, 6.1/118.7.
19, 20. *Intragranulitricolporites microporus* KDS. 1978, slide Csáv-I-1-9, 15.7/102.4.
21, 22. *Intragranulitricolporites wolffi* KDS. 1978, slide Csáv-I-1-1, 19.0/106.0.
23, 24. *Intragranulitricolporites grcmbasti* KDS. 1978, *Fabaceae*, slide Csáv-I-1-2, 16.7/116.9.
25, 26. *Nagyipollis* fsp., slide Csáv-I-2-4, 18.6/107.0.
N: x1000

Plate I.

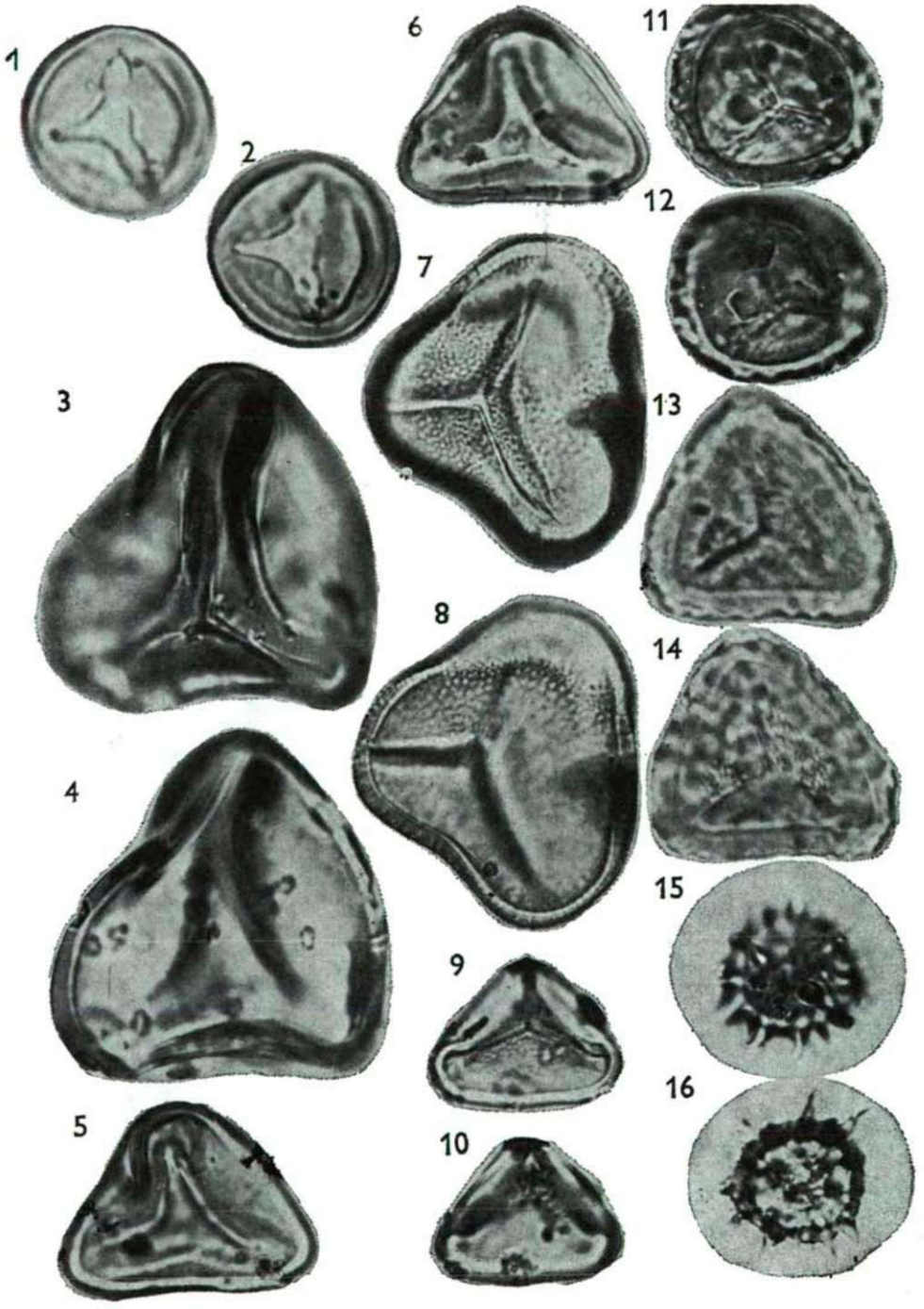

Plate II.

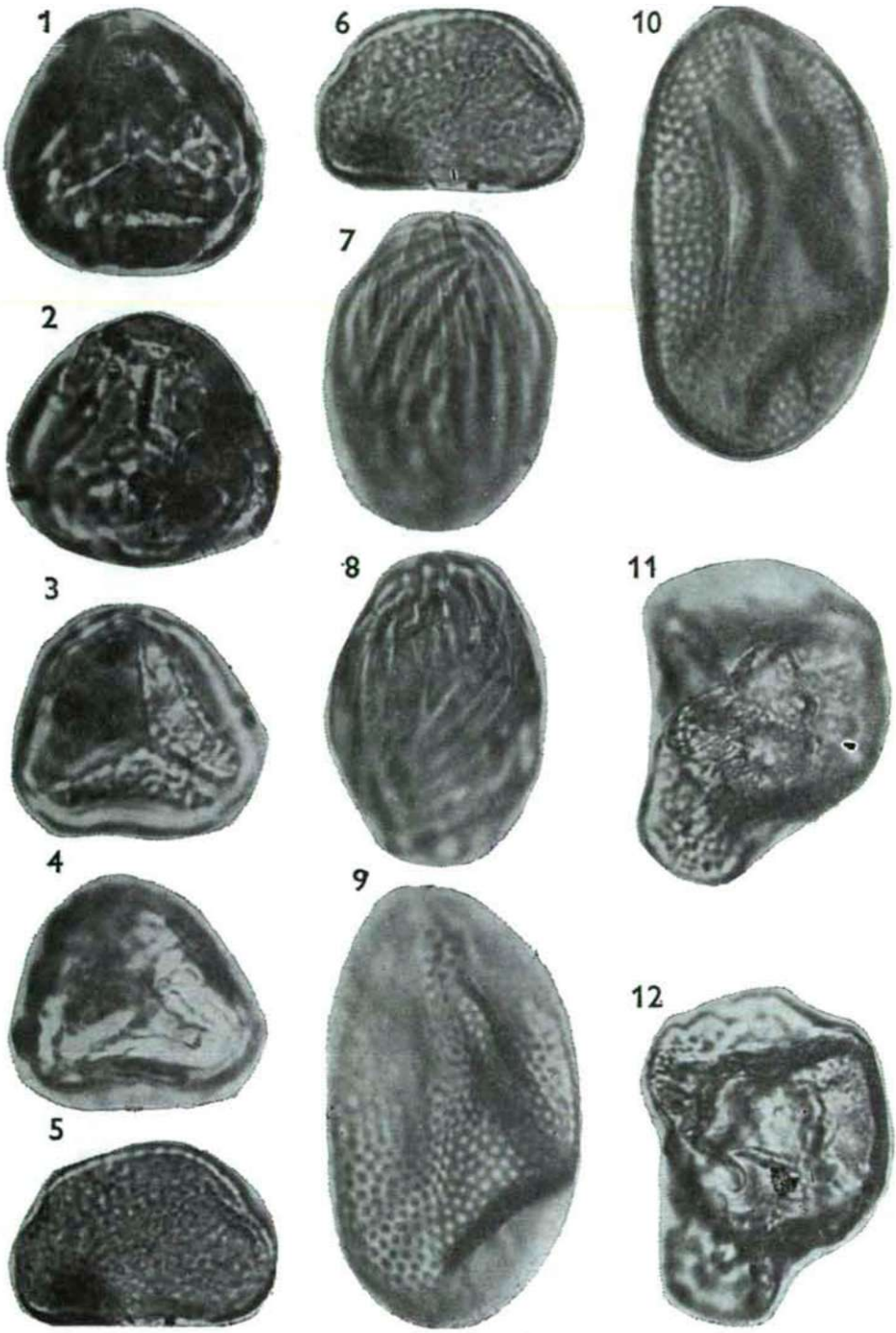

Plate III.

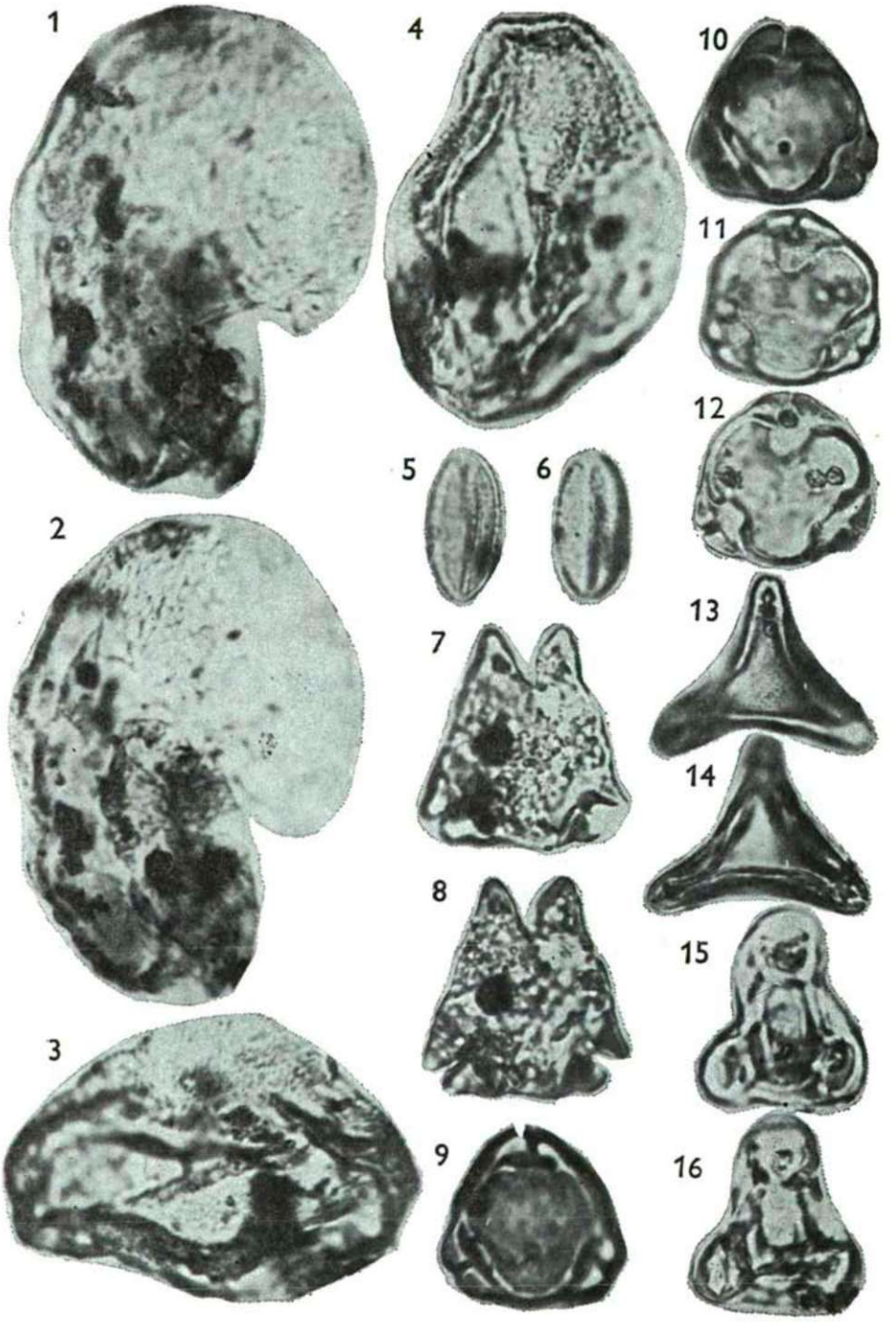

Plate IV.

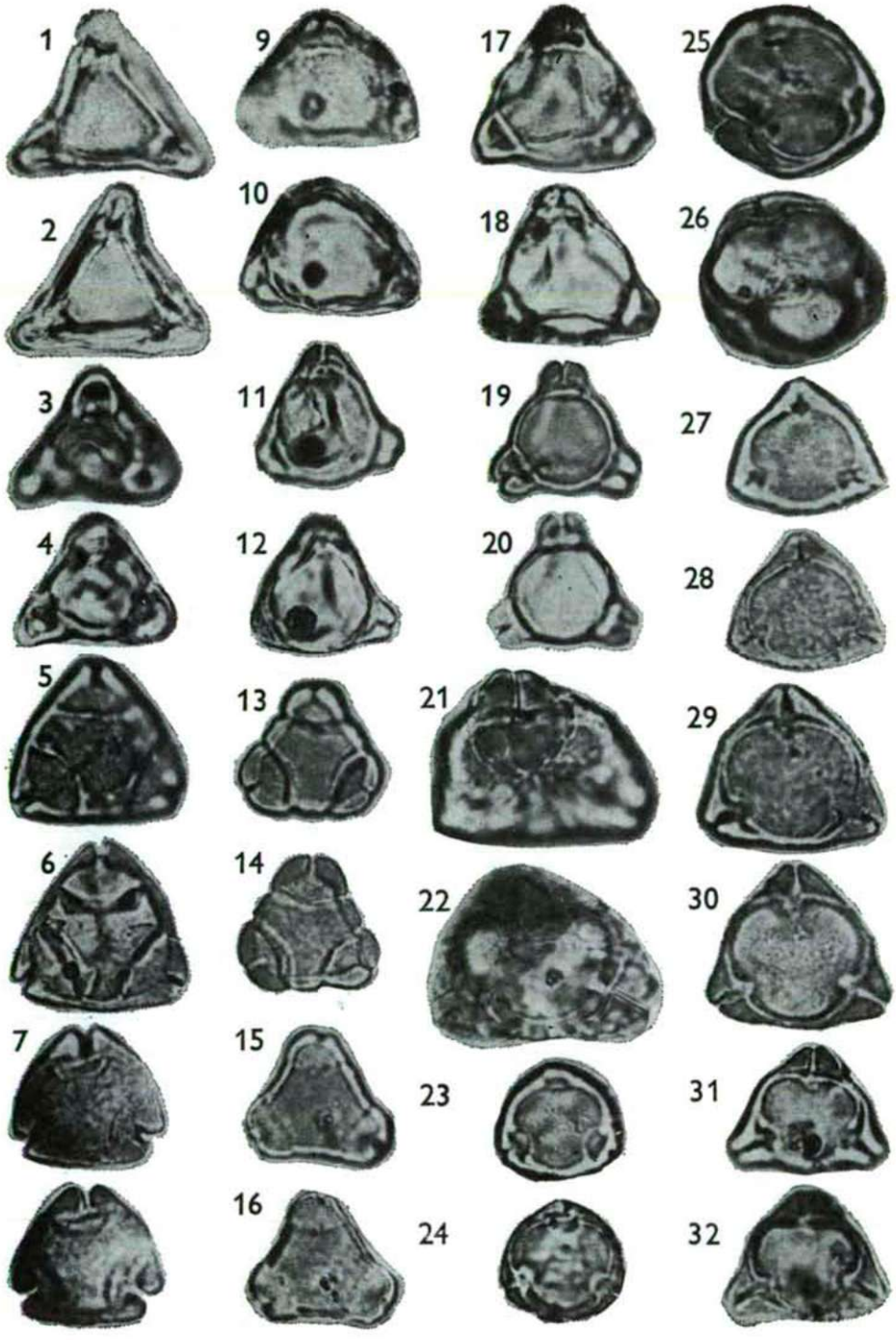
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Plate V.

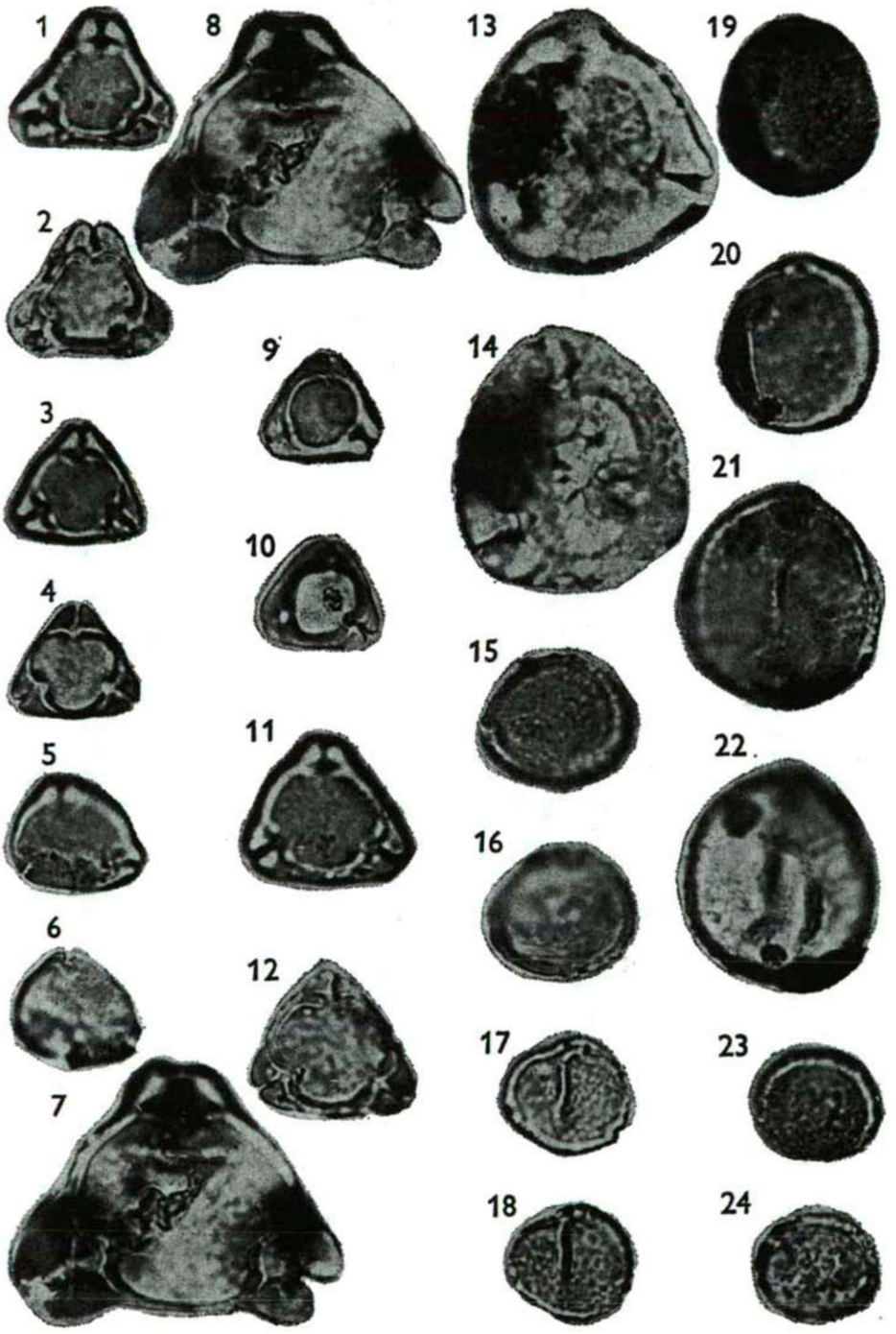
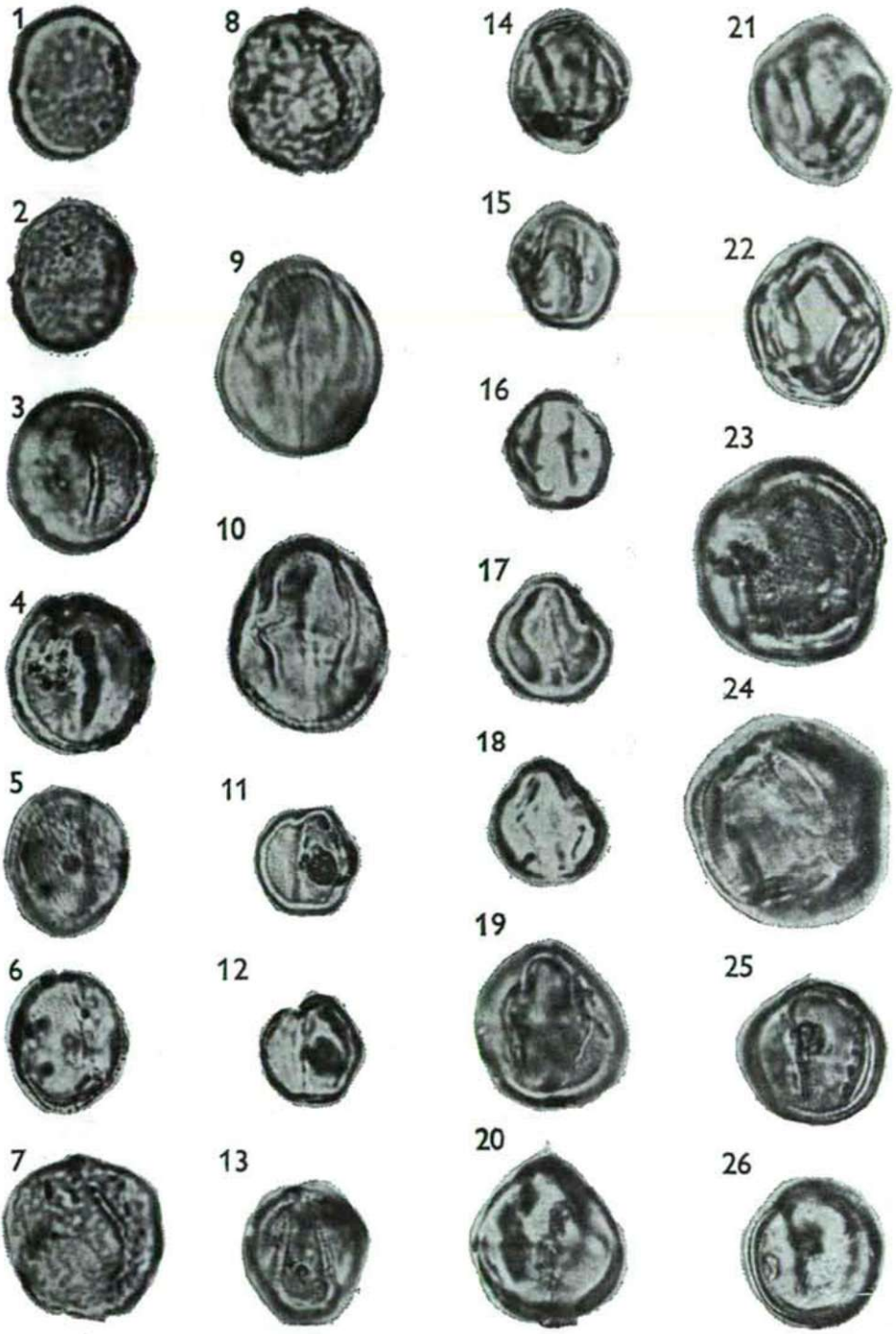


Plate VI.



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